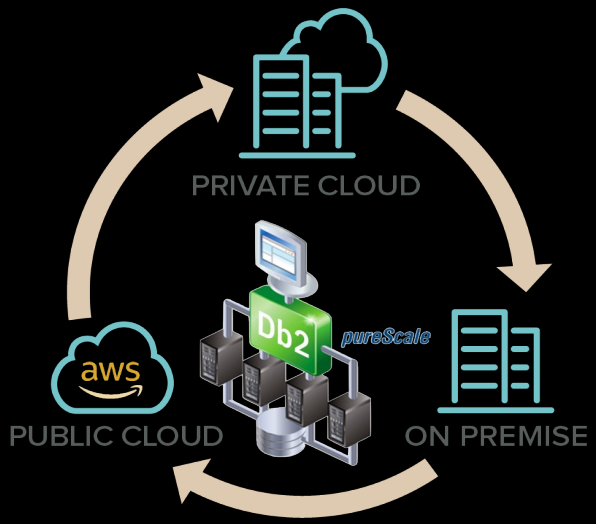
Db2 pureScale on AWS

The New Experience

The Db2Night Show™



- pureScale refresher
- The New Offering
- The Architecture
- Support
- Roadmap

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IBM Db2

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pureScale refresher

- The “Why”
- The “What”
- The deployment base

The Impact of *Downtime* to Your Business

64% of organizations require that their databases deliver a minimum of 99.99% or better uptime for their most mission critical applications *

Negative Press

Damaged Reputation

Lost Revenue

Loss of market share to competitors

pureScale

Availability	Downtime per Year
99.999%	5 minutes
99.99%	52 minutes
99.9%	8 hours, 45 minutes
99%	3.65 days
95%	18.25 days

Reduced IT / Employee Productivity

Customer dissatisfact-ion

Breach of SLA / Contract

Reduced Company / Shareholder Value

Reduced End-User Productivity

* ITIC Paper "Two-Thirds of Corporations Now Require 99.99% Database Uptime, Reliability ", Laura DiDio, July 10th, 2013

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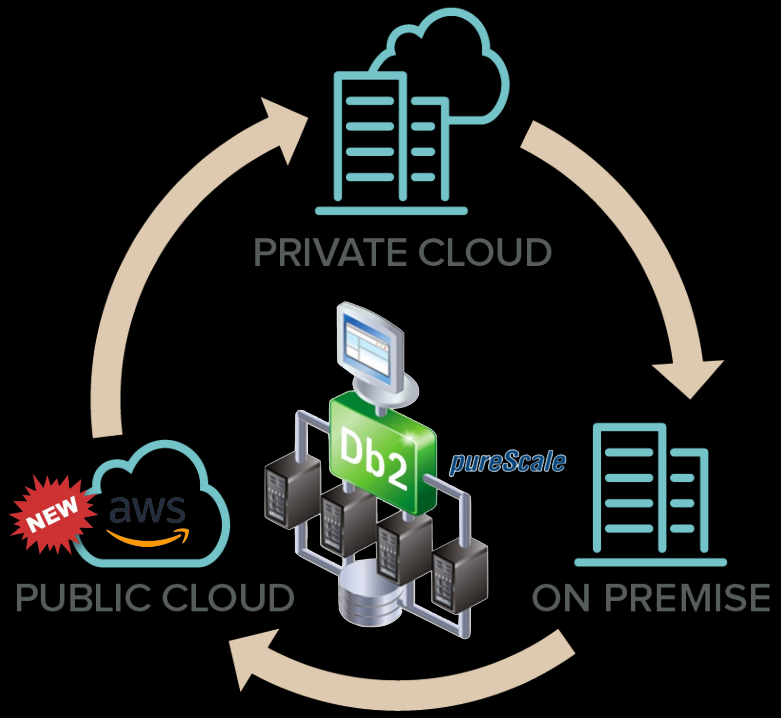
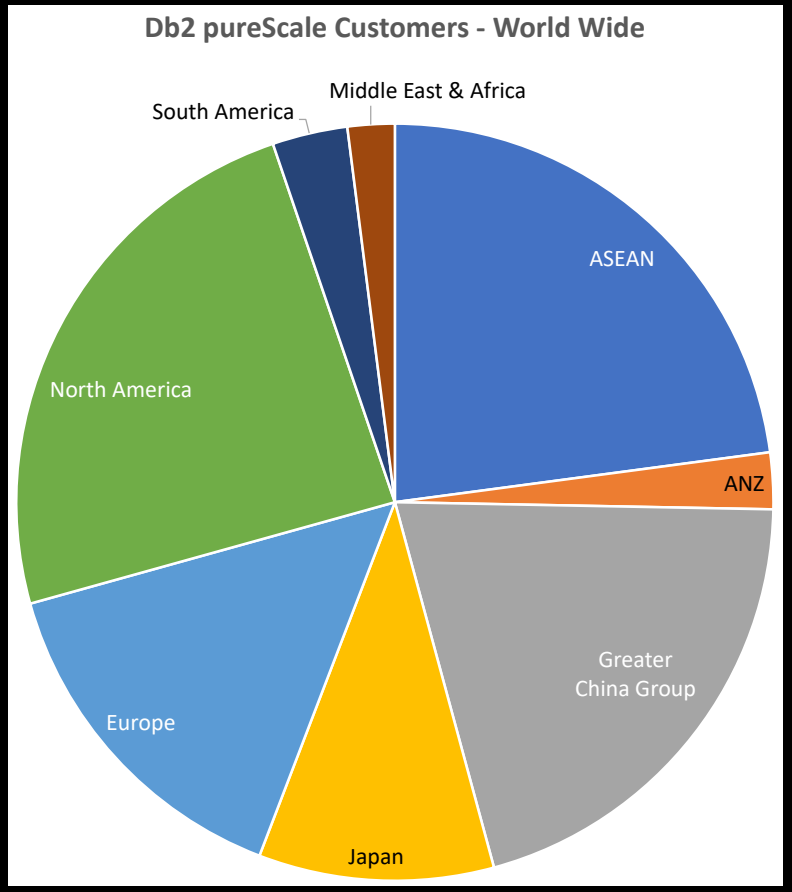
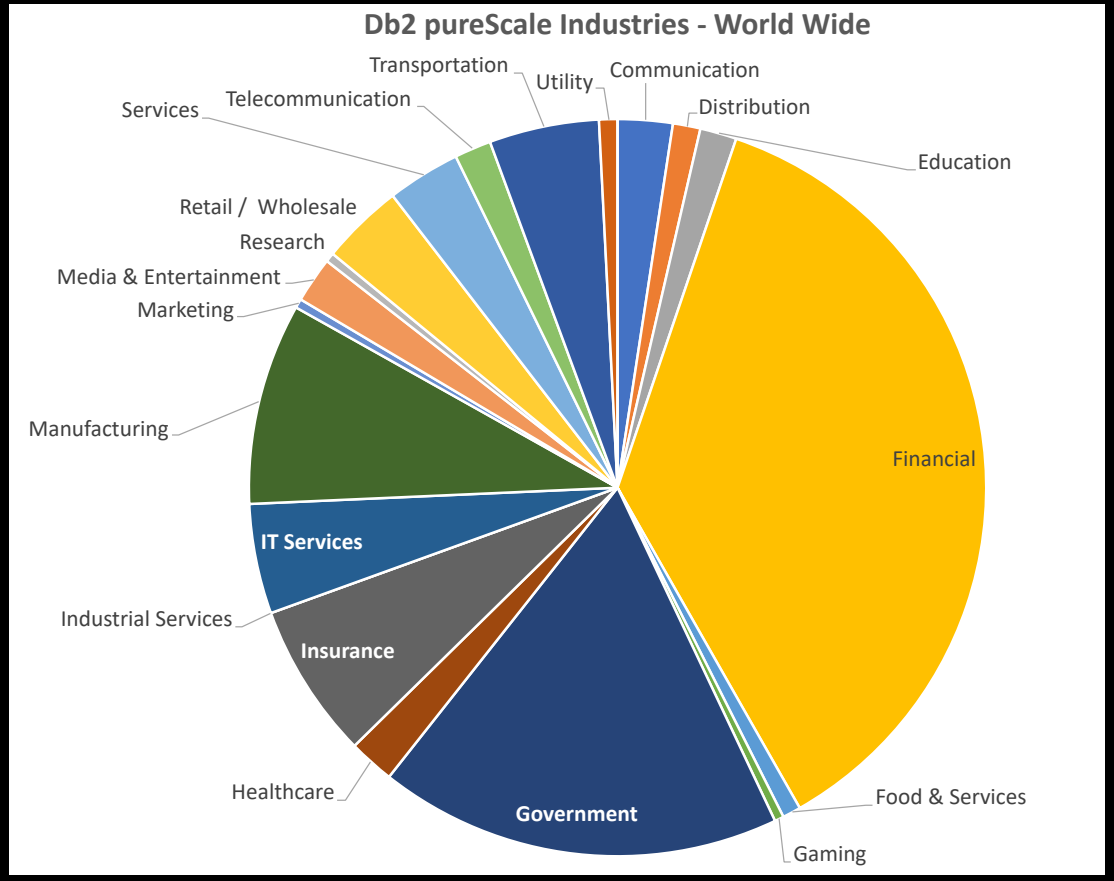
Db2's five 9s solution is pureScale



pureScale Successes at Every Geography and Every Industry





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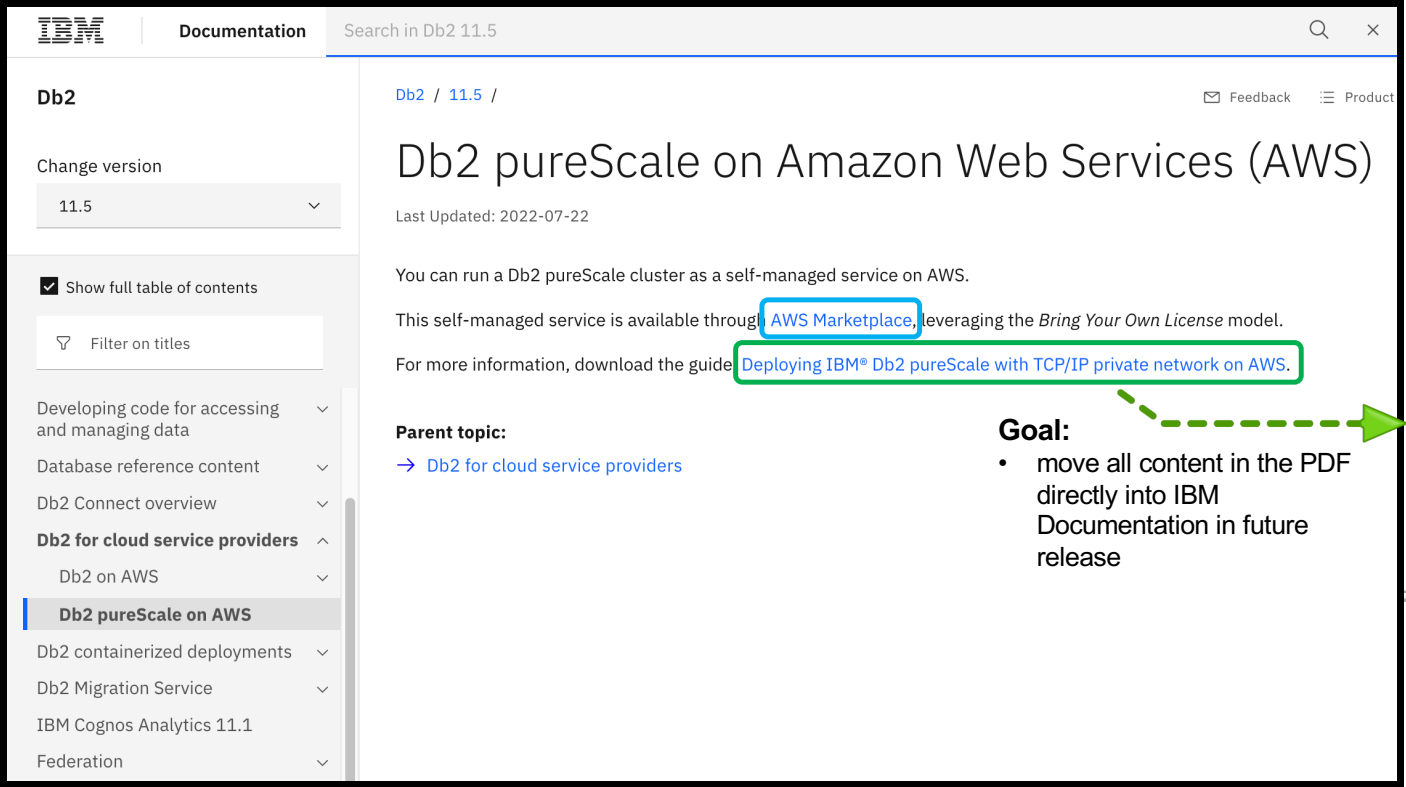
The New Offering

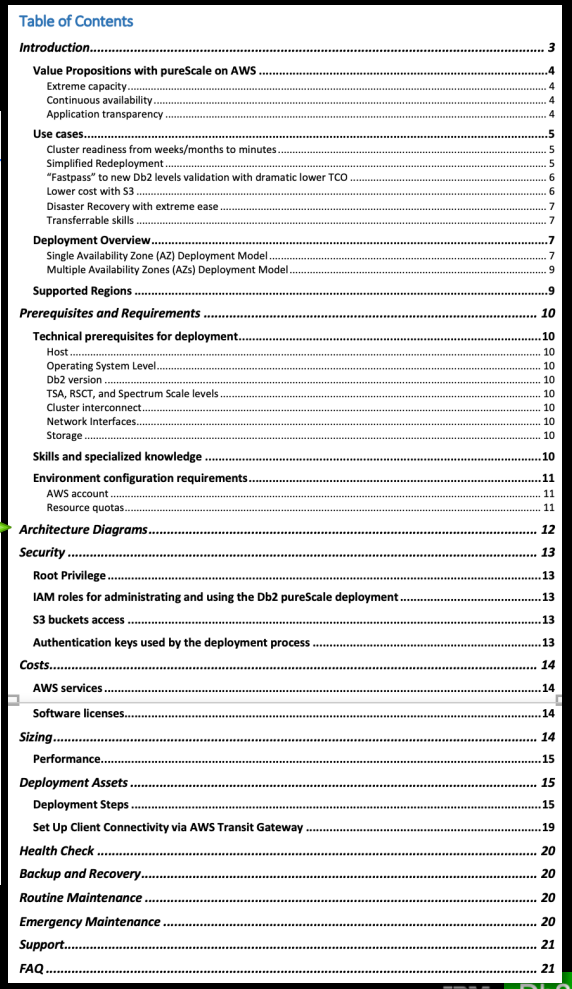
- AWS Marketplace landing page
- Our documentation
- The Deployment Journey
- Value Propositions
- T-shirt size and guidance

The Deployment Guide in IBM Documentation



Goal:

- move all content in the PDF directly into IBM Documentation in future release



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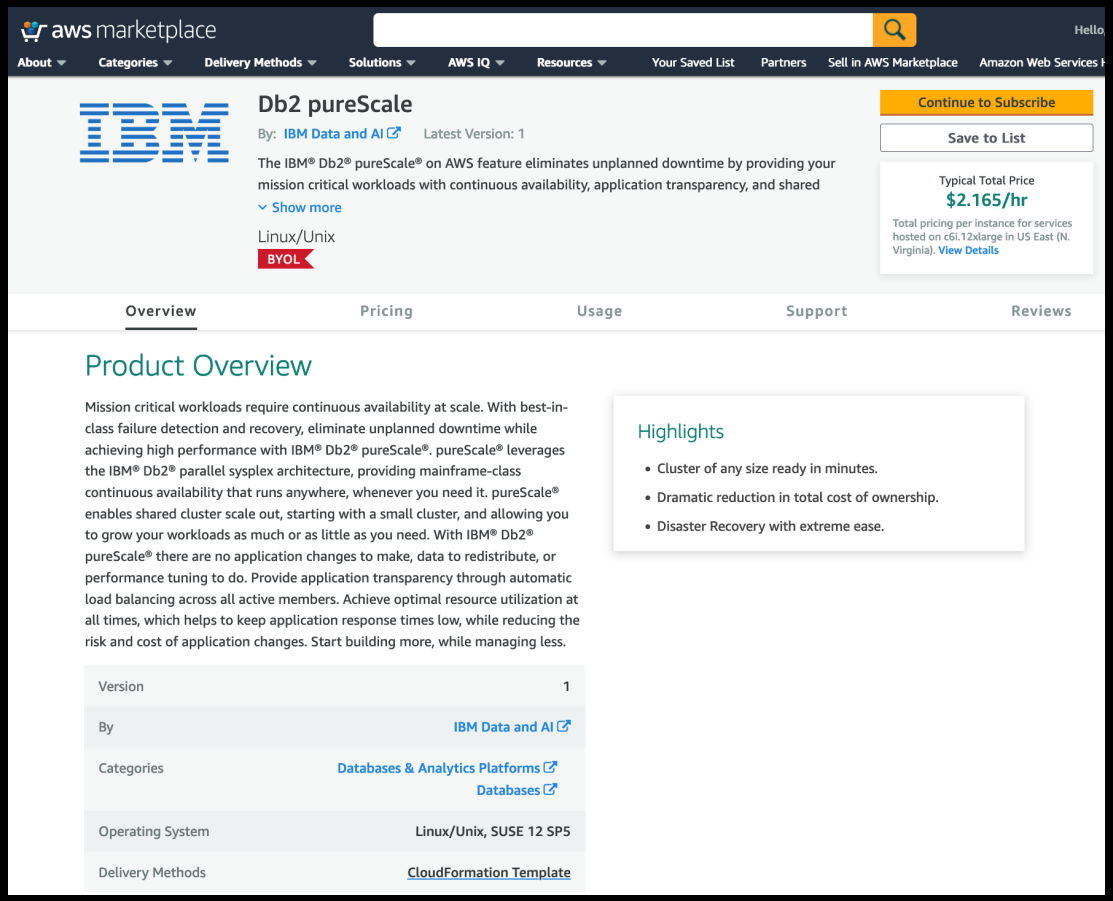
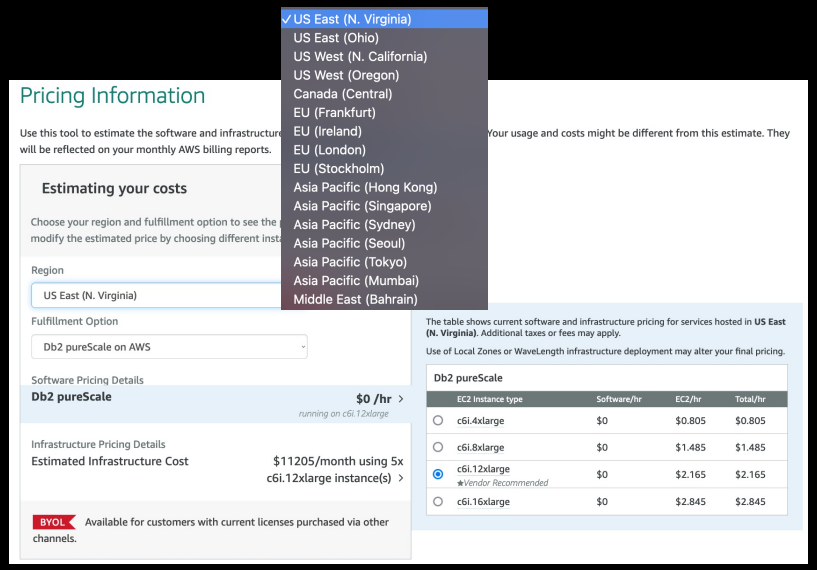
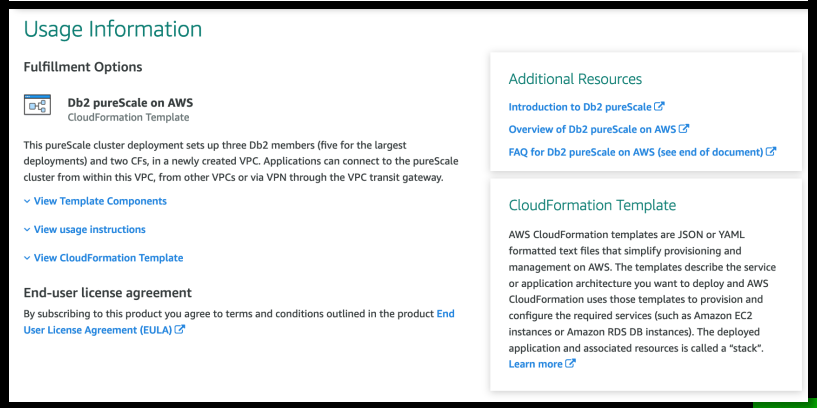
The offering in AWS Marketplace

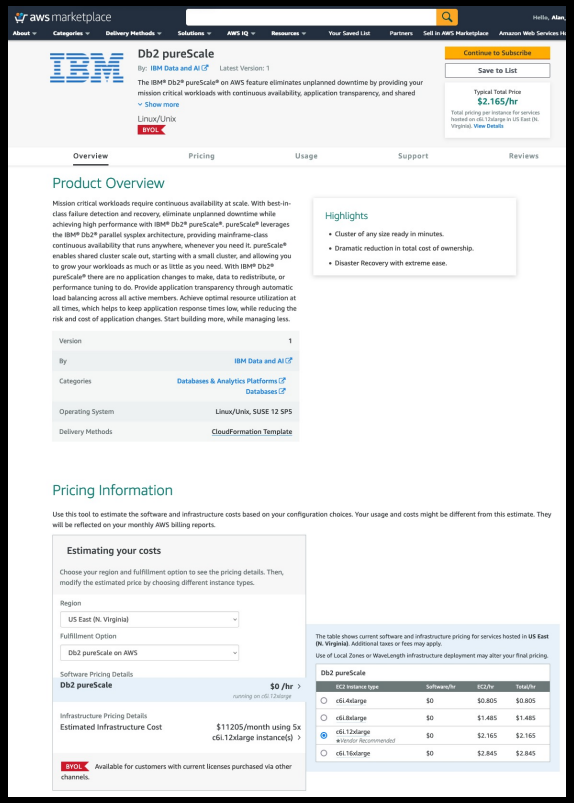


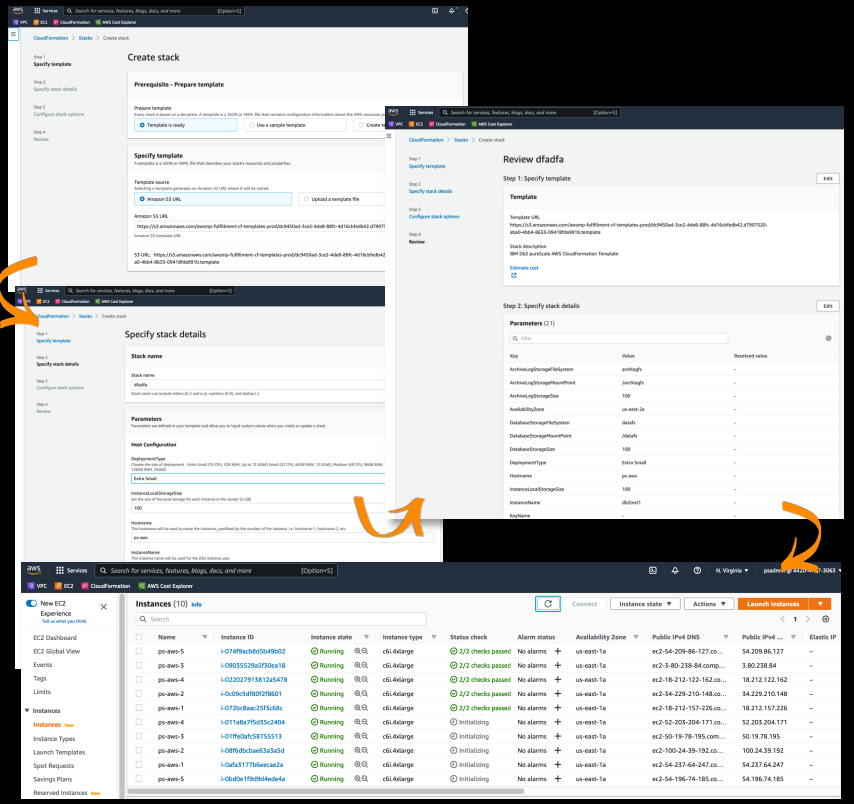


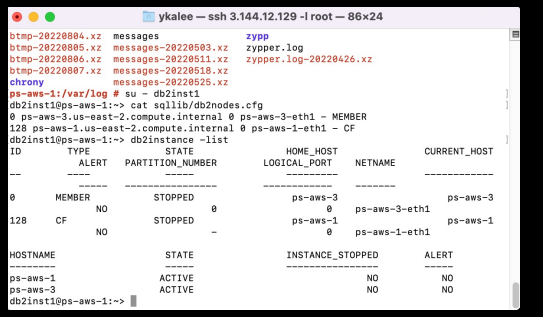


The Deployment Journey

AWS Marketplace → One-click Deployment → DB Setup & App Testing







EC2 instance status

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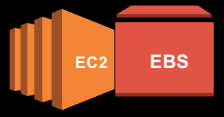
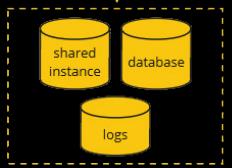
User Experience (*without* Automation)

1 Provisioning AWS Resources



2 Configure Multi-Attach Volumes



Deployment Guide – Configuring AWS Resources

- 1 x Virtual Private Cloud (VPC)
  - IPv4 CIDR 10.0.0.0/16
- 1 x Internet Gateway
- 1 x Route Table
- 2 x Subnets
  - One public subnet with IPv4 CIDR 10.0.0.0/24
  - One private subnet with IPv4 CIDR 10.0.1.0/24
- 1 x Network Access Control List (ACL)
- 1 x Security Group
  - * Allow traffic between public+private subnets
  - * SSH port open
- 5 x EC2 Instances, with the following per instance:
  - 1 x EBS Volume
  - 1 x Elastic IP
  - 2 x Network Interfaces
    - One part of public subnet
    - One part of private subnet
  - EBS-Optimized
  - Clustered Placement Group
- 4 x EBS Multi-Attach Volume
  - (Optional) 4 x EBS Snapshot

Deployment Guide – Installing Db2

1. Configure root access (ssh) for EC2 instances
2. Generate ssh key pairs for passwordless ssh
3. (Optional) Change root password for instances
4. Install and enable multipath
5. Configuring /etc/hosts
6. Enabling passwordless ssh
7. Update zypper repositories
8. Installing required packages for Db2: *patch make libgomp1 kernel-source kernel-headers m4 gcc-c++ cpp gcc chrony mksh*
9. Rebooting All Hosts
10. Configuring Known Hosts
11. Transferring Install Image to all hosts (BYOL)
12. Extracting Install Image on all hosts
13. Installing Db2 on all hosts (Db2_install)
14. Creating Spectrum Scale Cluster (mmcrcluster)
15. Accepting Spectrum Scale License
16. Creating Spectrum Scale NSD (Stanza, mmcrnsd)
17. Starting Spectrum Scale (mmstartup)
18. Creating Spectrum Scale File System (mmcrfs)
19. Creating Db2 Users and Groups
20. Creating Db2 Instances (db2icrt, db2iupdt)

3 Installing Db2 pureScale

4 Setup database/ Restore existing

Total Time - Approximately 2-3 Hours

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User Experience (*with* Automation)

1

Specify Non-Default Deployment Parameters

1. Deployment Type: **XS/S/M/L**
2. Root password
3. Availability Zone
4. SecurityGroupCIDR: 0.0.0.0/0
5. SSH Keypair: **mykey.pem**

~ 36 AWS Resources + Configuration

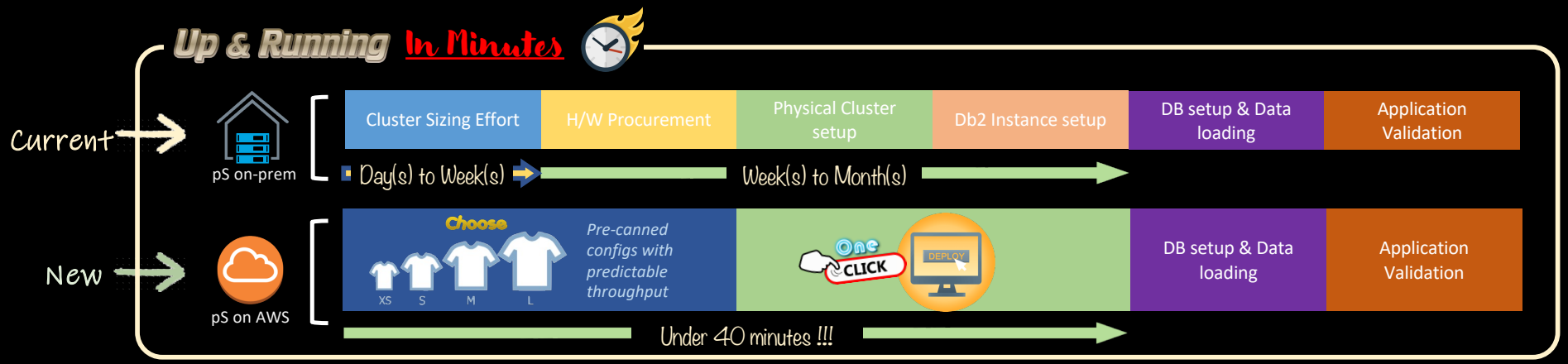
Seamless Db2 pureScale + Spectrum Scale Installation

2

Setup database/ Restore existing

Total Time - Approximately 40 Minutes for 3 members and 2 CFs

Up & Running In Minutes



A Revolutionary Experience

Much Lower TCO

with new and/or existing use cases

Cluster Redeployment	FASTPASS New Db2 Validation	Test Environments	HADR Instrumentation with 2 clicks

Transferrable skills from on-premises experiences

Management	Monitoring	Application Transparency	Minimal architectural differences
Database Admin	HA behaviours		

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Deployment Cluster size and throughput guidance

	X-SMALL (c6i.4xlarge) 3 Member + 2 CFs ❖ 16 CPU ❖ 32 Gb RAM ❖ 5000 IOPS ❖ Up to 12.5 GbE	SMALL (c6i.8xlarge) 3 Member + 2 CFs ❖ 32 CPU ❖ 64 Gb RAM ❖ 5000 IOPS ❖ 12.5 GbE	MEDIUM (c6i.12xlarge) 3 Member + 2 CFs ❖ 48 CPU ❖ 96 Gb RAM ❖ 7000 IOPS ❖ 18.75 GbE	LARGE (c6i.16xlarge) 5 Member + 2 CFs ❖ 64 CPU ❖ 128Gb RAM ❖ 10000 IOPS ❖ 25 GbE
Application Read/Write Ratio	SQL Statements Per Second			
70/30	70,000	125,000	300,000	350,000
90/10	110,000	190,000	440,000	770,000

On-premises
4 Member + 2 CFs

- 20 CPU
- 192 Gb RAM
- Comparable IOPS
- 10 GbE

R/W = 70/30 - yields 100,000 SQL statements per second

Instance setting, conventions

Example of a XS, S, and M deployment:

```
db2inst1@ykalee-oregon-1:~> db2instance -list
ID        TYPE            STATE                HOME_HOST                CURRENT_HOST             ALERT   PARTITION_NUMBER        LOGICAL_PORT   NETNAME
--        ----            -----                ---------                ------------             -----   ----------------        ------------   -------
0         MEMBER          STOPPED              ykalee-oregon-3          ykalee-oregon-3            NO                    0                   0   ykalee-oregon-3-eth1
1         MEMBER          STOPPED              ykalee-oregon-4          ykalee-oregon-4            NO                    0                   0   ykalee-oregon-4-eth1
2         MEMBER          STOPPED              ykalee-oregon-5          ykalee-oregon-5            NO                    0                   0   ykalee-oregon-5-eth1
128       CF              STOPPED              ykalee-oregon-1          ykalee-oregon-1            NO                    -                   0   ykalee-oregon-1-eth1
129       CF              STOPPED              ykalee-oregon-2          ykalee-oregon-2            NO                    -                   0   ykalee-oregon-2-eth1

HOSTNAME                  STATE                INSTANCE_STOPPED         ALERT
--------                  -----                ----------------         -----
ykalee-oregon-5           ACTIVE                             NO            NO
ykalee-oregon-4           ACTIVE                             NO            NO
ykalee-oregon-2           ACTIVE                             NO            NO
ykalee-oregon-1           ACTIVE                             NO            NO
ykalee-oregon-3           ACTIVE                             NO            NO
db2inst1@ykalee-oregon-1:~>
```

netnames

- Append "-eth<#>" to the hostname.

hostnames

- User specifies a common base name of all hostnames as one of the give mandatory parameters before deployment
- Deployment appends "-<#>" to it starting with 1 for CF 128, followed by 2 for CF 129. First member starts with 3 and so on.

/etc/hosts

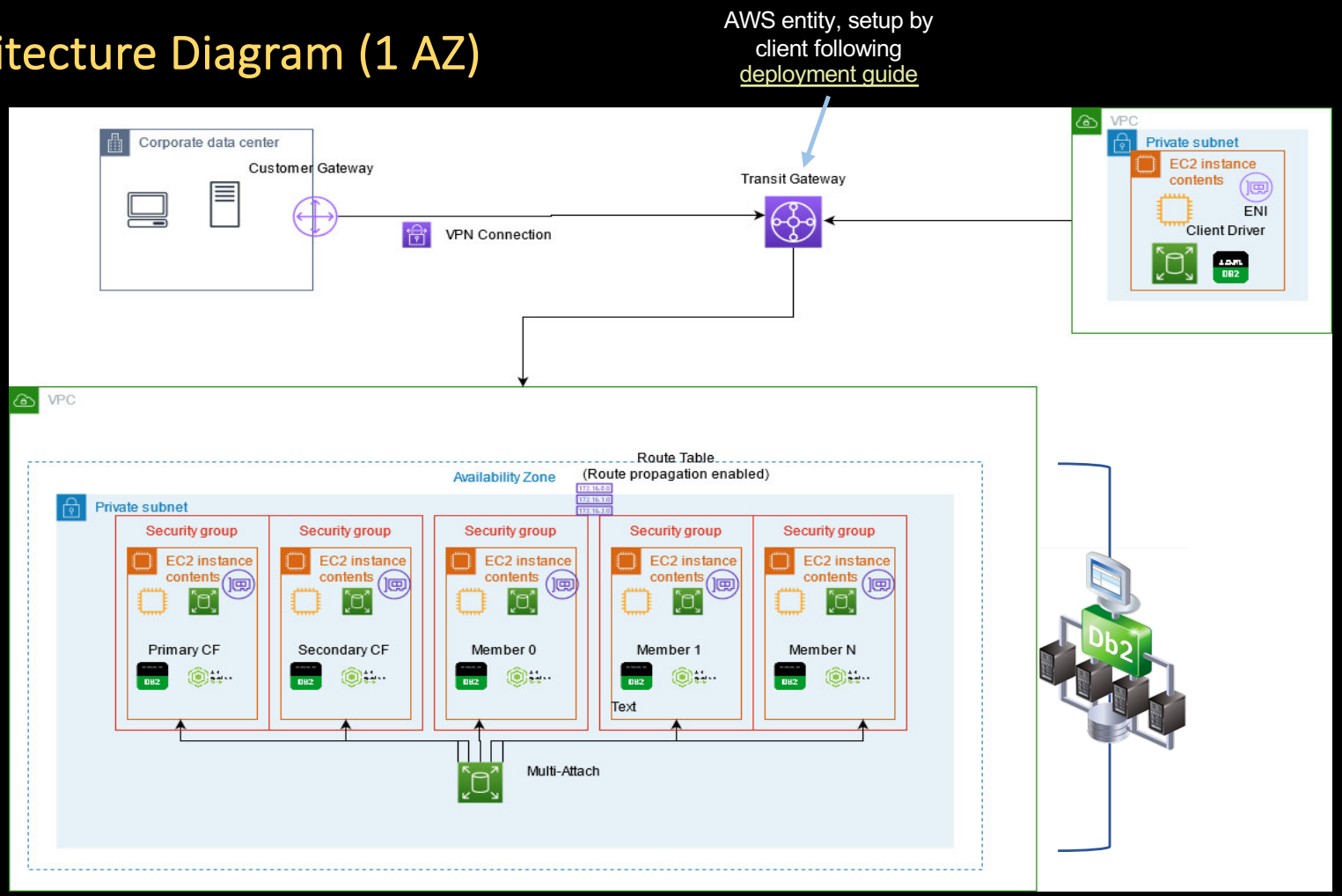
```
#Db2 pureScale Hostnames for Public Subnet
10.0.0.10       ykalee-oregon-1.us-west-2.compute.internal      ykalee-oregon-1
10.0.0.11       ykalee-oregon-2.us-west-2.compute.internal      ykalee-oregon-2
10.0.0.12       ykalee-oregon-3.us-west-2.compute.internal      ykalee-oregon-3
10.0.0.13       ykalee-oregon-4.us-west-2.compute.internal      ykalee-oregon-4
10.0.0.14       ykalee-oregon-5.us-west-2.compute.internal      ykalee-oregon-5


#Db2 pureScale Hostnames for Private Subnet
10.0.1.10       ykalee-oregon-1-eth1.us-west-2.compute.internal         ykalee-oregon-1-eth1
10.0.1.11       ykalee-oregon-2-eth1.us-west-2.compute.internal         ykalee-oregon-2-eth1
10.0.1.12       ykalee-oregon-3-eth1.us-west-2.compute.internal         ykalee-oregon-3-eth1
10.0.1.13       ykalee-oregon-4-eth1.us-west-2.compute.internal         ykalee-oregon-4-eth1
10.0.1.14       ykalee-oregon-5-eth1.us-west-2.compute.internal         ykalee-oregon-5-eth1
```

The Architecture

- 100,000’ view
- On-premises Vs Cloud
- Disaster Recovery solution

Architecture Diagram (1 AZ)



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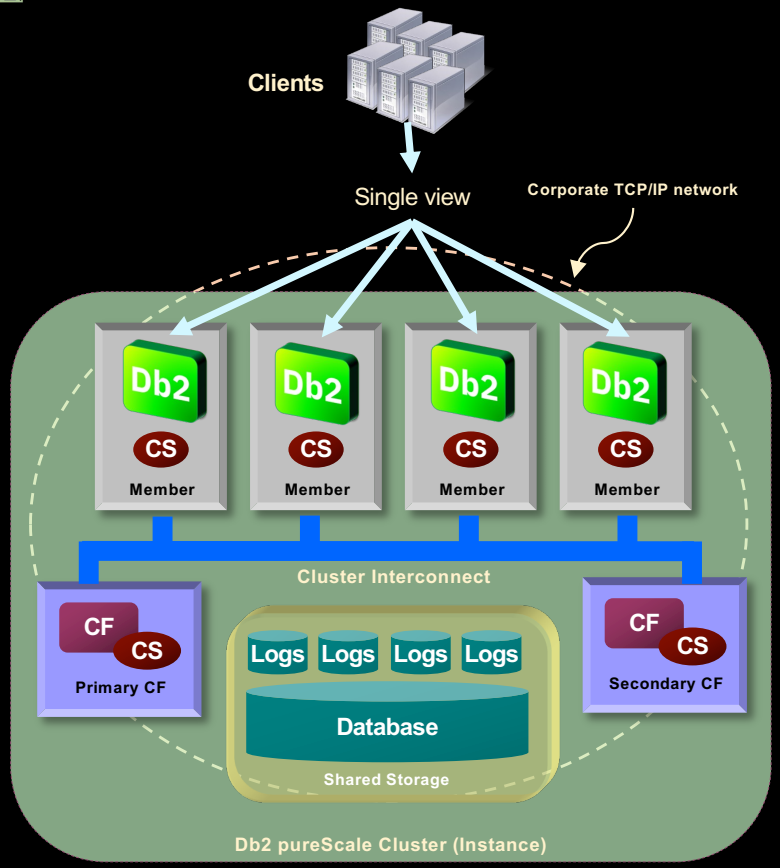
On-premise

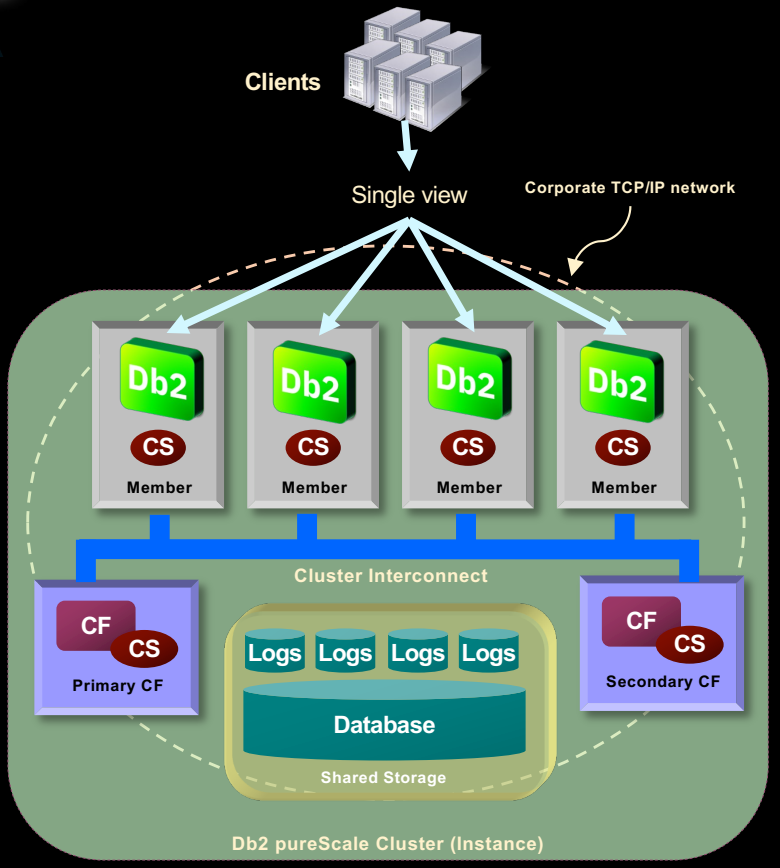
On-premises Architecture



VS

Cloud Architecture

AWS



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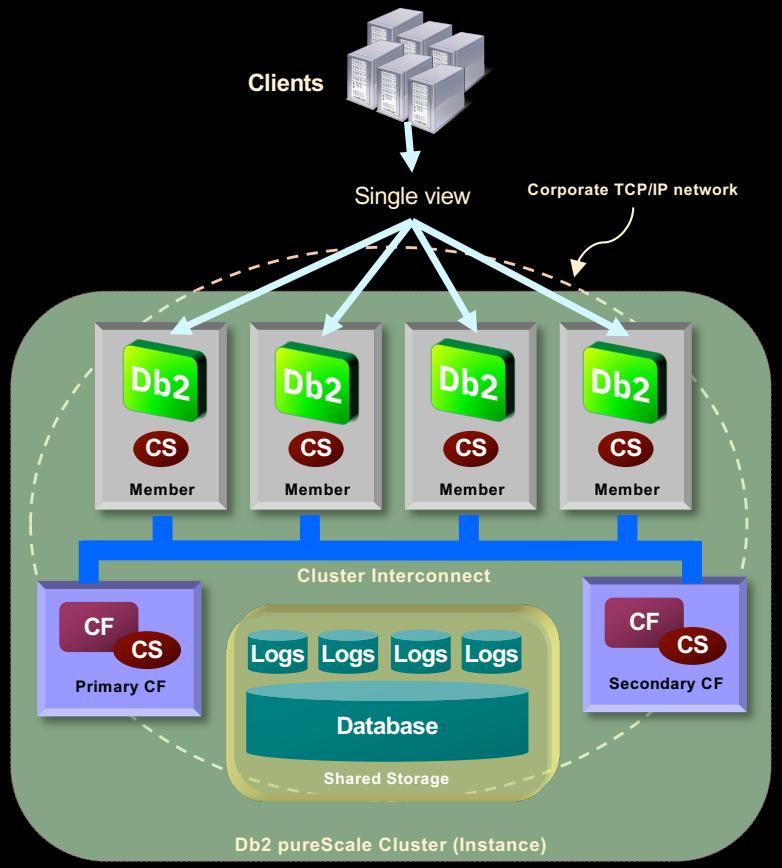
Component Side-by-Side View



* On selected architecture(s) only

On-premise

AWS

Client connect anywhere … see single database

- Clients connect into any member
- Automatic workload balancing
- No change functionally and Db2 setup
- Need to setup AWS Transit gateway for inbound traffic outside of current VPC

Db2 engine runs on several host computers

- Co-operate with each other to provide coherent access to the database from any member

Integrated Cluster Services (CS)

- Failure detection, recovery automation, cluster FS
- In partnership with STG (Spectrum Scale, RSCT) and Tivoli SA MP (TSA) *(to be replaced by Pacemaker later)*

Cluster Interconnect between members and CFs

- Special optimizations provide low latency, high speed on RDMA-capable interconnects (e.g. 10/40*/100Gb RoCE)
- Vanilla Ethernet also supported
- Support Ethernet *for now*
- RDMA equivalent in future release

Cluster caching facility (CF)

- Efficient global locking and buffer management
- Synchronous duplexing to secondary ensures availability

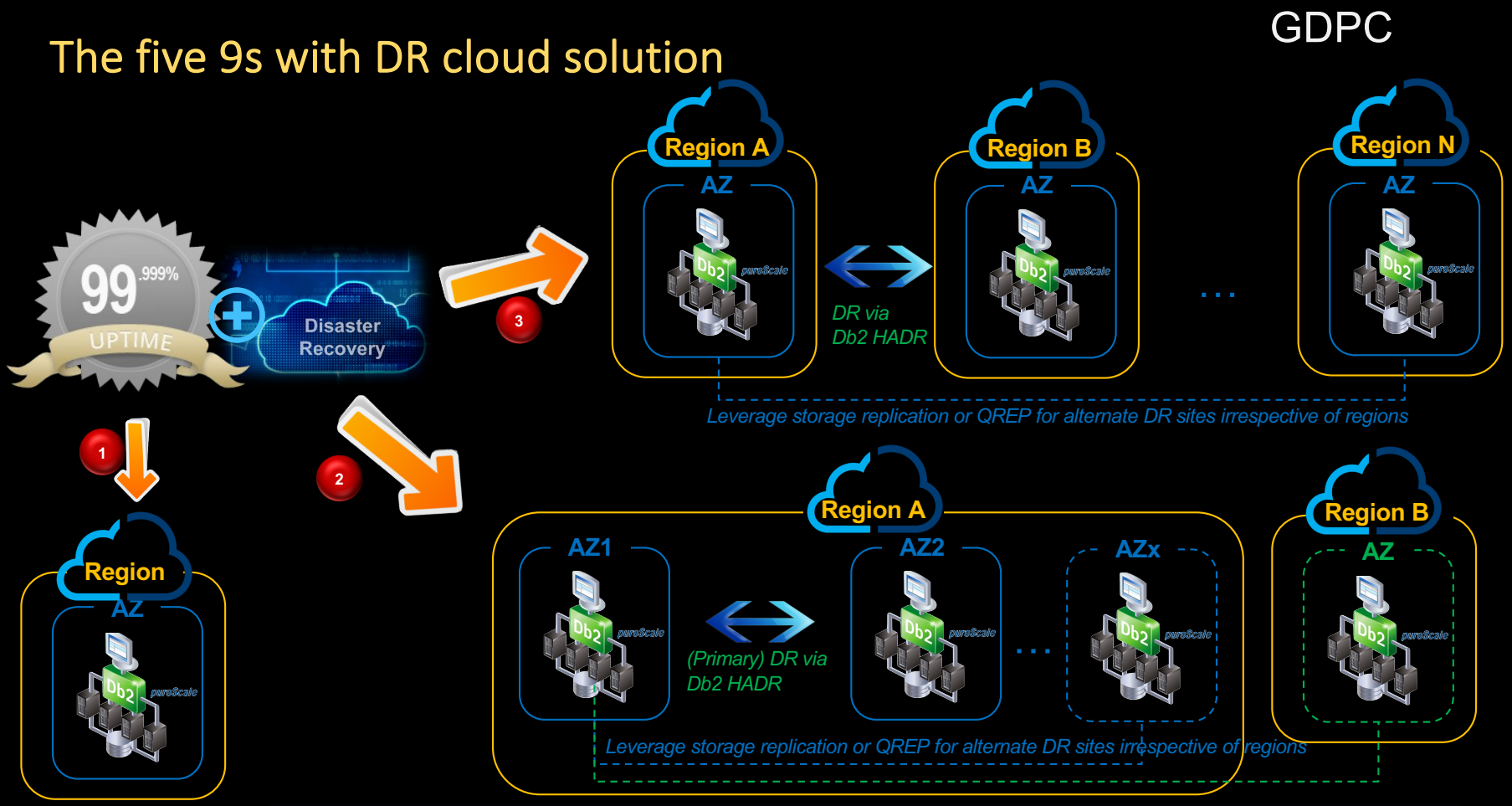
Data sharing architecture

- Shared access to database
- Members write to their own logs
- Logs accessible from another host (used during recovery)
- Same shared storage via new multi-attach EBS support in AWS
- Limited to 16 host and within same region
- No support of SCSI-3 PR.

Key “Delta” between offering on cloud vs on-premises

AWS		ON-PREMISE
Speed, ease of deployment	Strength	Full autonomy, customized config.
No up-front cost	Capital Investment	Huge upfront + depreciation cost
Latest within same major release	Db2 version	“Any”
Intel	H/W Architecture	POWER, Intel, Z
RHEL or SLES	OS Choices	AIX, RHEL or SLES
Pre-configured size	Cluster Topology	Customizable
TCP/IP	Cluster Interconnect	RDMA, TCP/IP
Majority Node	Quorum	Disk tiebreaker
Disk Leasing	I/O Fencing	SCSI-3 PR
HADR	Integrated DR options	HADR, GDPC

The five 9s with DR cloud solution

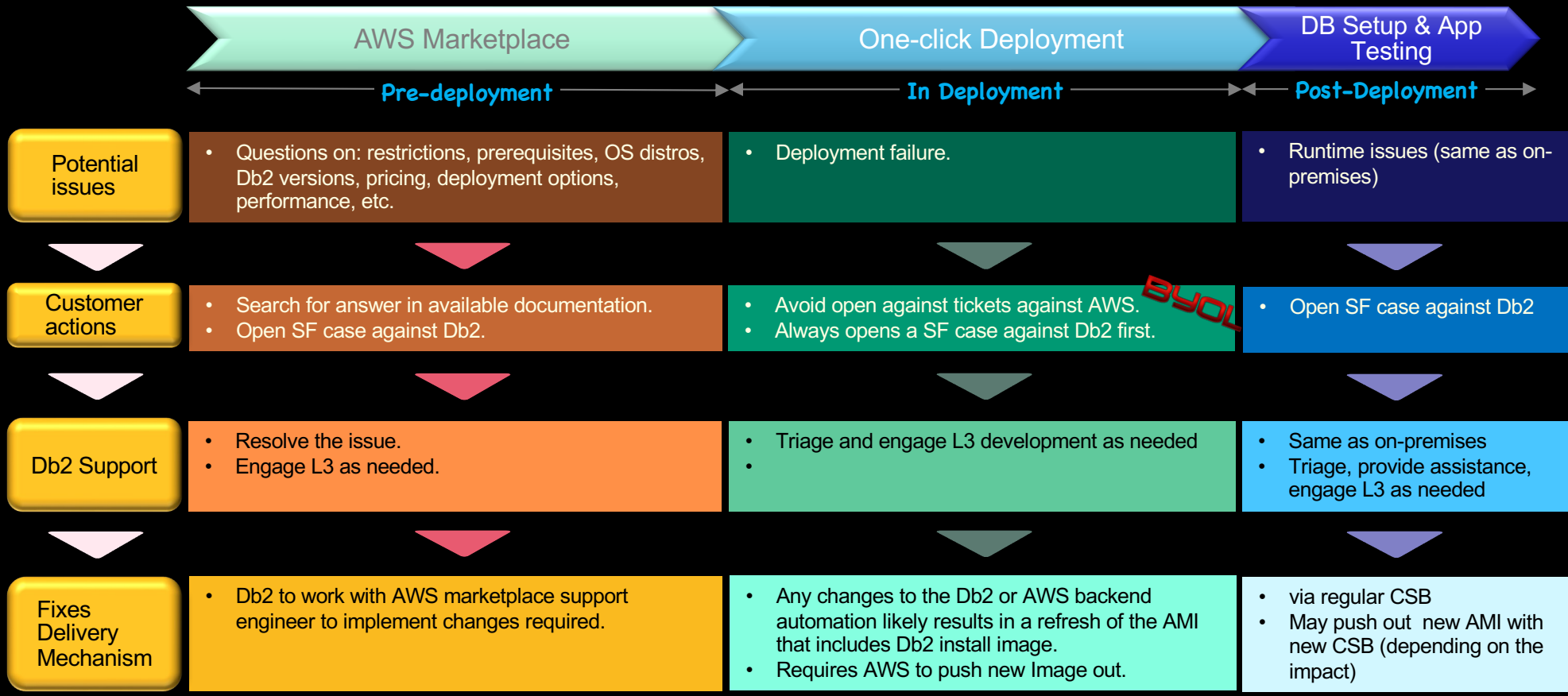


Goal: *Leverage on-premises architecture as much as possible, preserve HA characteristics.*

Support

- The 3 phases
- Common Issues
- Ongoing maintenance / updates

The three phases



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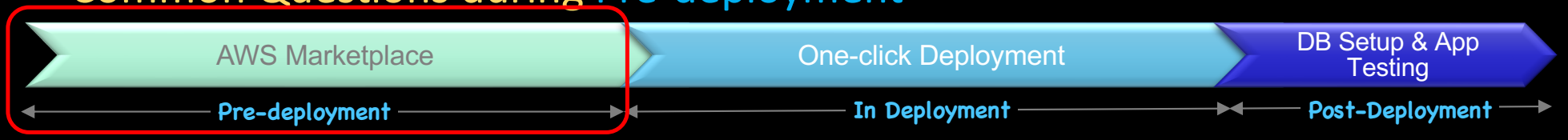
Common Questions during Pre-deployment



Q1: *The current offering is based on TSA as cluster manager, can we deploy Pacemaker in such a way to automate the failover from primary site to standby site ?*
A: No

Q2: *Can AWS EBS Snapshot be used in DR site (in a different region) ?*
A: Yes, will need to suspend I/O just like on-premises via SET WRITE SUSPEND, etc.

Q3: *Can altering the configuration of the EC2 instance after deployment, such as lowering IOPS at night for cost reduction, void support from IBM?*
A: No, the cluster is under customers' control once deployed just as on-premises. But customers should consider the impact of change, validate it on a test environment before implementing it in production.

Q4: *How many versions of Db2 will be kept in the AWS marketplace and how often will it be refreshed ?*
A: Only the latest mod pack / fix pack in each major release (starting from 11.5) will be kept. It will always be refreshed at each fix pack, mod pack, and major release boundary. It may also be refreshed due to PSIRTS or certain pervasive HIPER APAR(s).

Note: These will be added to FAQ in deployment guide

Post-Deployment maintenance

Host maintenance for H/W, non-Db2 S/W, or OS upgrade:

- Follow "Maintenance in a Db2 pureScale environment"

Db2 fix pack, mod pack or cumulative special build update:

- Follow "Applying fix packs in Db2 pureScale environments" for:
  - Offline update procedures
  - Online update procedures
  - Concurrent update procedures

- **Placing mount points associated with database-level mount resources into maintenance mode**
  You can perform maintenance on a specific mount point that is associated with a database level mount resource in the TSA resource model. Maintenance can be done without affecting the member resource's availability. This command must be run as the Db2 instance owner.
- **Performing maintenance on a Db2 pureScale host**
  You can perform maintenance on or apply updates to a member host without affecting the availability of the databases in the Db2 pureScale instance.
- **Replacing both cluster caching facilities**
  You can replace both cluster caching facilities using a rolling upgrade technique which ensures that your Db2 pureScale instance will not experience an outage.
- **Adding a disk to the shared file system**
  After creating your shared file systems, there might be circumstances which require adding additional disks to the file system.
- **Quiescing a member**
  Certain circumstances might require you to temporarily remove a member from the cluster (for example, maintenance operations).
- **Putting hosts into maintenance mode**
  The term *host* referenced in this page refers to a Db2 member or Db2 cluster facility (CF) residing in either a physical host or a logical partition (LPAR) on supported platforms such as AIX. If you are applying software updates to Db2 cluster services or making changes to the server that impacts Db2, you must put the target host into maintenance mode. You can also put a host into maintenance mode if you want to ensure that members or cluster caching facilities are not restarted on the host when you are making updates to the operating system or hardware on the host.
- **Putting a cluster into maintenance mode**
  You can put a cluster into maintenance mode when you are making updates to the operating system or hardware on the hosts in the cluster.
- **Moving a Db2 member or a cluster caching facility**
  There are a number of reasons to move a Db2 member or a cluster caching facility from one host to another. This task outlines a number of possible scenarios and some additional factors to consider.
- **Recovering from a failed db2iupdt -add or -drop operation in a Db2 pureScale environment**
  There are a number of reasons why a **db2iupdt** `-add` or `-drop` operation might fail, leaving the Db2 pureScale environment topology in an inconsistent state.
- **Clearing resource model alerts**
  In a Db2 pureScale environment, hardware- or software-related alerts can exist on the status table for members, cluster caching facilities (CFs), and for hosts. In some cases, the alert conditions are transient so the alert field might clear itself; however, in other cases, the alert field remains set until the administrator resolves the problem and manually clears the alert .

Changes to host configuration in terms of memory or cores may be dynamic from host perspective, but

- Db2 may not recognize it until after the next instance restart
- Db2 may not recognize it at all IF the memory size is **not** set to automatic

IBM Db2

Roadmap

Roadmap from feature perspective

Categories	GA #1 (Q2 2022)	GA #2 (Q4 2022)	Future
Up & Running	One-click deployment from H/W to S/W		
Costs	AWS resources + Db2 license (BYOL)		
Disaster Recovery	HADR within same region; Qrep, storage	HADR - cross regions	
Db2 Version	V11.5.6.0	V11.5.8.0	Latest
Distros/OS levels	SLES 12 SP5 only	RHEL 8.6, SLES 15P3	Latest
Cluster	TCP/IP		EFA (RDMA equivalent)
I/O Fencing	Disk leasing (60+ secs)		SCSI-3PR equivalent (2-3 secs)
Cluster Size	Boxed in cluster size - XS, S, M, L		Potentially add XL
Cluster Manager	TSA		Pacemaker only

- New deployment will use 11.5.8.0 from here onwards
- Only the latest version within the same major release will be kept.

Timeline and deliverables subjected to change

Q&A
IBM
PURESCALE
Db2
amazon marketplace